REMARKS

This Preliminary Amendment, which requests changes to the Figures as well as the Specification, is filed before the substantive examination of the above-referenced application.

Changes to the Figures

Regarding the reference numeral 175 shown in Figure 1A, but not mentioned in the description, Applicants have deleted that reference numeral in Figure 1A. Applicants request entry of amended Figure 1A.

Regarding the reference numeral 260a shown in Figure 3, but not mentioned in the description, Applicants have replaced reference numeral 260a in Figure 3 with reference numeral 260. Support for this amendment is provided in the Specification, page 16, lines 14-23. Applicants request entry of amended Figure 3.

Regarding the reference numerals 811b and 811c shown in Figure 8B, but not mentioned in the description, Applicants have deleted those reference numerals in Figure 8B. Applicants request entry of amended Figure 8B.

Regarding the reference numerals 810d, 828, 830m, 830n, 830o, 830p, 840h, 840i, and 840k shown in Figure 8D, but not mentioned in the description, Applicants have deleted those reference numerals in Figure 8D. Applicants request entry of amended Figure 8D.

Regarding the reference numeral 330a shown in Figures 9A and 9B, but not mentioned in the description, Applicants have replaced reference numeral 330a with reference numeral 330. Support for this amendment is provided in the Specification, page 36, lines 12-13.

Regarding the reference numeral 1009c shown in Figure 10B, but not mentioned in the Description, Applicants have

deleted that reference numeral in Figure 10B. Applicants request entry of amended Figure 10B.

Regarding the reference numerals 1064a-1064j shown in Figure 10C, but not mentioned in the Description, Applicants have deleted those reference numerals in Figure 10C. Applicants request entry of amended Figure 10C.

Changes to the Specification

Regarding the reference numerals 192a, 192b, 194a, 194b, 196a, and 196b shown in Figure 1B, but not mentioned in the description, Applicants have amended the Specification, page 4, line 17 to page 5, line 10 to parenthetically refer to hammerheads 192a and 192b, biases 194a and 194b, and assist features 196a and 196b. Because this paragraph, without amendment, refers to hammerheads 192, biases 194, and assist features 196 and Figure 1B clearly illustrates these features, Applicants submit that no new matter is added by the amendment to the Specification and therefore request entry of Applicants' amendment to this paragraph.

Regarding the reference numerals 225a, 225b, and 225c shown in Figure 2, but not mentioned in the description, Applicants have amended the Specification, page 14, lines 9-17 to parenthetically refer to design layers 225a, 225b, and 225c. Because this paragraph, without amendment, refers to one or more design layers 225 and Figure 2 illustrates boxes labeled "design layer(s)", Applicants submit that no new matter is added by the amendment to the Specification and therefore request entry of Applicants' amendment to this paragraph.

Regarding the reference numerals 235a, 235b, and 235c shown in Figure 2, but not mentioned in the description, Applicants have amended the Specification, page 14, lines 9-17

to parenthetically refer to design layers 235a, 235b, and 235c. Because this paragraph, without amendment, refers to mask layouts 235 and Figure 2 illustrates boxes labeled "mask layout(s)", Applicants submit that no new matter is added by the amendment to the Specification and therefore request entry of Applicants' amendment to this paragraph.

Regarding the reference numerals 450a, 450b, 450d, 450e, 450f, and 450g shown in Figure 4C, but not mentioned in the description, Applicants have amended the Specification, page 18, lines 3-10 to refer to contours 450a-450g. Because this paragraph, without amendment, refers to contours 450, Applicants submit that no new matter is added by the amendment to the Specification and therefore request entry of Applicants' amendment to this paragraph.

Regarding the reference numeral 465 shown in Figure 4D, but not mentioned in the description, Applicants have amended the Specification, page 19, lines 1-8 to refer to model output 465. Because this paragraph, without amendment, refers to the model output (3 instances) and Figure 4D illustrates a label "model output" associated with reference numeral 465, Applicants submit that no new matter is added by the amendment to the Specification and therefore request entry of Applicants' amendment to this paragraph.

Regarding the reference numeral 640 mentioned in the description, but not shown in the figures, Applicants have amended the Specification, page 27, lines 2-7 to replace reference numeral 640 with reference numeral 540. Support for this amendment is provided by the Specification, page 21, lines 3-14 that describe a profile 540 of a model amplitude. Therefore, Applicants submit that no new matter is added by the amendment to the Specification and request correction of

the typographical error by entry of the Applicants' amendment to this paragraph.

Regarding the reference numeral 829 shown in Figure 8D, but not mentioned in the description, Applicants have amended the Specification, page 33, line 21 to page 34, line 4 to refer to dmax 829 and generally to Figure 8D. Because this paragraph, without amendment, refers to the actual segment length dmax and Figure 8D illustrates a label "dmax" associated with reference numeral 829, Applicants submit that no new matter is added by the amendment to the Specification and therefore request entry of Applicants' amendment to this paragraph.

Regarding the reference numerals 830r and 830s shown in Figure 8E, but not mentioned in the description, as well as reference numerals 840r and 840s mentioned in the description, but not shown in the figures, Applicants have amended the Specification, page 35, line 17 to page 36, line 5 to refer to points 830r and 830s. Because this paragraph, without amendment, refers to points 840r and 840s spaced Ldet 822 from the projection point 850 and Figure 8E illustrates points 830r and 830s as being a distance Ldet 822 from the projection point 850, Applicants submit that no new matter is added by this typographical error correction to the Specification and therefore request entry of Applicants' amendment to this paragraph.

Regarding the reference numerals 840m and 840n shown in Figure 8E, but not mentioned in the description, Applicants have amended the Specification, page 35, line 17 to page 36, line 5 to refer to evaluation points 840m and 840n. Because this paragraph, without amendment, refers to evaluation points placed at the midpoint of the segments defined by points spaced distance Ldet 822 from the projection point 850 and

Figure 8E illustrates point 840m as being at the midpoint of the segment defined by projection point 850 and point 830r (a distance Ldet apart) and point 840n as being at the midpoint of the segment defined by projection point 850 and point 830s (a distance Ldet apart), Applicants submit that no new matter is added by the amendment to the Specification and therefore request entry of Applicants' amendment to this paragraph.

Regarding the reference numeral 919 shown in Figure 9A, but not mentioned in the description, Applicants have amended the Specification, page 37, lines 1-12 to refer to step 919. Because this paragraph, without amendment, refers to splitting an edge evenly into two segments with dissection points at both vertices and at the mid-point of the edge, and Figure 9A illustrates a step 919 including the descriptor "select vertices & midpoint as dissection pts", Applicants submit that no new matter is added by the amendment to the Specification and therefore request entry of Applicants' amendment to this paragraph.

Regarding the reference numeral 922 shown in Figure 9A, but not mentioned in the description, Applicants have amended the Specification, page 37, lines 13-17 to refer to step 922. Because this paragraph, without amendment, refers to selecting both vertices of the polygon as dissection points as well as selecting the two points spaced away from the two vertices by the distance Lcor, and Figure 9A illustrates a step 922 including the descriptor "select points Lcor from vertices and vertices as dissection points", Applicants submit that no new matter is added by the amendment to the Specification and therefore request entry of Applicants' amendment to this paragraph.

Regarding the reference numeral 945 shown in Figure 9B, but not mentioned in the description, Applicants have amended

the Specification, page 38, lines 8-11 to refer to step 945. Because this paragraph, without amendment, refers to splitting a segment evenly into two segments by adding a dissection point in the midpoint of the segment, and Figure 9B illustrates a step 945 including the descriptor "select midpoint as dissection point", Applicants submit that no new matter is added by the amendment to the Specification and therefore request entry of Applicants' amendment to this paragraph.

Regarding the reference numerals 1024a and 1024b shown in Figure 10A, but not mentioned in the description, Applicants have amended the Specification, page 40, line 13 to page 41, line 2 to refer to sections 1024a and 1024b as well as shifters 1010a and 1010b. Because this paragraph, without amendment, refers to the polygon 1020 including wide trim sections 1024 entirely within shifters 1010, and Figure 10A illustrates trim sections 1024a and 1024b entirely within shifters 1010a and 1010b, respectively, Applicants submit that no new matter is added by the amendment to the Specification and therefore request entry of Applicants' amendment to this paragraph. Note that reference numeral 1001a provided in the Description, but not illustrated, is amended in the Specification to conform with Figure 10A. Specifically, the reference to true-gate 1001a is amended to true-gate 1001. Applicants also therefore request entry of this amendment to the same paragraph.

Regarding the reference numerals 1025a and 1025b shown in Figure 10B, but not mentioned in the Description, Applicants have amended the Specification, page 43, lines 14-22 to refer to trim sections 1025a and 1025b. Because this paragraph, without amendment, refers to the vertices 1054f and 1054g, and Figure 10B illustrates these vertices as part of trim sections

1025a and 1025b, respectively, Applicants submit that no new matter is added by the amendment to the Specification and therefore request entry of Applicants' amendment to this paragraph.

Regarding the reference numerals 1009f, 1022b, and 1090b shown in Figure 10C, but not mentioned in the Description, Applicants have amended the Specification, page 45, line 23 to page 46, line 2 to refer to connector 1009f, polygon 1022b, and end cap 1090b. Because this paragraph, without amendment, refers to polygon 1022 (also amended by Applicants to polygon 1022a) providing connector 1009d, trim regions 1026a and 1026b, and end cap 1090a, and Figure 10C illustrates a similar polygon 1022b, Applicants submit that no new matter is added by the amendment to the Specification (in which polygon 1022b provides connector 1009f, trim regions 1026c and 1026d, and end cap 1090b) and therefore request entry of Applicants' amendment to this paragraph.

Regarding the reference numeral 136 mentioned in the description, but not shown in the figures, Applicants have deleted that reference numeral in the Specification, page 49, line 15 to page 50, line 2.

CONCLUSION

Claims 1-63 are pending in the present application. Allowance of these claims is respectfully requested. Attached is a marked-up version showing the amendments in a document entitled "VERSION WITH MARKINGS TO SHOW CHANGES MADE". If there are any questions, please telephone the undersigned at (408) 451-5907 to expedite prosecution of this case.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service as FIRST CLASS MAIL in an envelope addressed to: Box Non-Fee Amendment, Assistant Commissioner for Patents, Washington, D.C., 20231, on March 15, 2002.

Date: 3/15/02 Signature: Rebecca A. Baumann

VERSION WITH MARKINGS TO SHOW CHANGES MADE

SPECIFICATION

Page 4, line 17 to page 5, line 10:

Figure 1B illustrates various ways mask items 190 are modified to correct for such effects. Figure 1B is not a particular example of a particular set of corrections that actually mitigate the proximity effects illustrated in Figure 1A. The corrections available include hammerheads 192 (i.e. hammerheads 192a and 192b) added to ends of items to compensate for overexposure of the entire end line of a feature. Also shown are biases 196 (i.e. biases 196a and 196b) applied along portions of a straight edge of a feature. A negative bias like 196 represents a portion of an opaque area made transparent (or a portion of a window made opaque). In this case the negative bias reduces the size of the item on a mask to avoid generating the spurious feature 182 of Figure 1A. Also shown are assist features 194 (i.e. assist features 194a and 194b), which are separate items smaller than the resolution of the photolithographic process and thus too small to be formed in a photoresist layer, but which are sufficiently large to effect diffraction patterns that influence larger nearby features. The assist features 194 are intended to move the edge 185 of the printed features 180 in Figure 1A toward the outline 171 of the original mask items 170. Also shown is a sub-resolution serif 193 of extra opaque material to compensate for overexposure at convex corners of opaque areas, and an anti-serif 197 indicating where opaque material, if any, is removed to compensate for underexposure at concave corners of opaque polygons. These corrections are listed to illustrate the concepts of correcting a mask to

compensate for proximity effects. The illustrated corrections do not necessarily correct the depicted features.

Page 14, lines 9-17:

The conventional processes include the Functional EDA process 210 that produces the schematic diagram 215. The physical EDA process 220 converts the schematic diagram to a design layout made up of one or more design layers 225 (e.g. design layers 225a, 225b, and 225c). After mask layouts 235 (e.g. mask layouts 235a, 235b, and 235c) are produced, the conventional processes employ a fabrication process 240 to produce the printed features layer 249. The printed features layer 249 may be a layer in a printed circuit or the mask used to produce the layer in the printed circuit. In the former case, the fabrication process includes one process 243 for forming the mask and a second process 245 to produce the layer of the integrated circuit using the mask. If the printed features layer 249 is the mask, step 245 is skipped.

Page 18, lines 3-10:

Figure 4C illustrates contours 450a-450g of constant amplitude on a two dimensional array of model output for one kind of proximity effects model, if it were to be run for every point on such an array. One particular contour representing the threshold value, contour 450c, is shown as a bold line. The shapes formed by the bold contour 450c represent this model's prediction of the shape of the printed features accounting for all proximity effects in the system. As can be seen by the bold contour 450c in Figure 4C, this proximity effects model predicts printed features with shapes that agree with those that actually would be produced on the printed features layer, as shown in Figure 4B.

Page 19, lines 1-8:

The threshold value 470 of about 0.3 model amplitude units corresponds to the value of contour 450c. Where the model output 465 is above the threshold value 470, a feature is predicted to be printed in the printed features layer; where the model output 465 is below the threshold value 470, no feature is predicted to be printed. Where the model output 465 equals the threshold value is where the edge of the printed feature is predicted to lie. Of course model output units are arbitrary and could be inversely related to what is printed, so that low amplitudes represent printed features and high amplitudes represent no printing. In such a case, the threshold would mark the value below which a feature is printed.

Page 27, lines 2-7:

The profiles such as [640] 540 can be generated by any method known in the art. In one embodiment, the test patterns used to build the model are used. These test patterns already include a range of features at different scales and model output computed on a relatively dense output grid. Thus with substantially no additional computations than those already made to build the proximity effects model in the first place, model amplitudes along various polygon edges are already available for deriving dissection parameters.

Page 33, line 21 to page 34, line 4:

Corner, line-end and turn-end dissection lengths are used in those circumstances even if projection points are also present. Projection points control segment lengths in the

interior portions of an edge away from the vertices, as will be described later below. Away from corner segments (including all of short edges like line-ends and turn-ends) and projection points, residual portions of an edge are divided evenly so that no segment is greater than Lmax and no segment is shorter than the shorter of Lcor and Ldet. Though controlled by the prescribed dissection parameters Lcor, Ldet and Lmax, the actual length of these segments (dmax) (see dmax 829, for example, in Figure 8D) is derived from the original vertex positions.

Page 35, line 17 to page 36, line 5:

In the preferred embodiment, dissection in the vicinity of the projection point is carried out by placing a dissection point 830q at the projection point 850 and at two other points [840r] 830r and [840s] 830s spaced Ldet 822 from the projection point 850. Evaluation points 840m and 840n are then placed at the midpoint of the segments so defined. In another embodiment, an evaluation point is placed at the projection point, and two dissection points spaced Ldet from each other straddle the evaluation point. Such an embodiment is not preferred because it does not allow for different corrections on either side of the projection point as needed for most circumstances, for example, as needed for curve 540 in Figure 5B. In yet another embodiment, the segment centered on the projection point of this previous embodiment is augmented with two additional segments of length Ldet, one each on either side of the first segment. While such an arrangement allows for different corrections near to and on either side of the projection point, it requires three evaluations rather than the two evaluations of the preferred embodiment.

Page 37, lines 1-12:

In step 916, the edge length L is necessarily greater than double the minimum dissection length, and it is determined whether the edge is long enough to accommodate two corner segments of length Lcor and an intervening segment of length Ldet. If not, the edge is treated as a line end or as a turn-end. In step 918 it is determined whether the edge is a turn end, i.e., includes both a convex corner and a concave vertex. If not, the edge is a line end and dissection points are placed at the two vertices in step 915 and control passes to step 370 to place the evaluation point. If one vertex is a convex vertex and the other is a concave vertex, so that the edge is a turn-end, it is determined in step 920 whether the edge length L is less than double Ldet. If not, then the edge is split evenly into two segments with dissection points at both vertices and at the mid-point of the edge in step 919. If the edge length L is less than double Ldet, then the edge is kept as one segment with dissection points at the vertices in step 915. In either case, control then passes to step 370 to select evaluation points.

Page 37, lines 13-17:

If it is determined in step 916 that the edge length is long enough, two corner segments are placed on the edge, by selecting both vertices of the polygon as dissection points as well as selecting the two points spaced away from the two vertices by the distance Lcor in step 922. A residual edge length is computed by subtracting double the corner dissection segment length, i.e., subtracting 2*Lcor, from the edge length L.

Page 38, lines 8-11:

In step 944 the residual length LR is necessarily greater than or equal to double Ldet, and it is determined whether the residual length LR is also less than triple Ldet. If [so] not, the segment is split evenly into two segments by adding a dissection point in the midpoint of the segment in step 945. If [not] so, control passes to step 946.

Page 40, line 13 to page 41, line 2:

Figure 10A illustrates two rectangular shifters 1010a and 1010b that form a true-gate_1001 along a portion of the area between the shifters 1010. For example, shifter 1010a is bounded by four edges connecting vertices 1031, 1036, 1037 and 1038. Also shown is a polygon 1020 used in a second exposure to connect the true-gate 1001[a] to other features, not shown, with connecting features 1009a and 1009b. Edges connecting vertices 1040, 1043, 1045, 1046, 1047 and 1048 are on polygon 1020. The polygon 1020 includes wide trim sections 1024 (i.e. 1024a and 1024b) entirely within the shifters 1010 (i.e. 1010a and 1010b) where there is no material on the layer being exposed the second time. The purpose of the trim sections 1024 is to prevent overexposing the edge of the true-gate 1001 during the second exposure. The edges of the trim sections 1024 inside the shifters 1010 do not leave edges on the printed features layer. For example, no edges are printed corresponding to mask edges connecting vertices 1043 to 1045, 1045 to 1046, and 1046 to 1047. Also, the edges of the shifters outside the trim polygon are not printed. For example, the edge connecting vertex 1038 to vertex 1037 is not printed.

Page 43, lines 14-22:

Other arrangements yield other results. For example, Figure 10B shows an arrangement that has one edge of true-gate 1002 formed by a portion of one edge of polygon 1021, between vertices 1054f (of trim section 1025a) and 1054g (of trim section 1025b). The true gate corners on this edge are at points 1055a and 1055b. Both of these true-gate corners are also intersections of the shifters 1011 with this edge of the polygon 1021. Whether this edge is further dissected depends on the distance between these corners. If the distance from 1055a to 1055b is less than the minimum segment length, e.g., the lesser of Lcor and Ldet, then this edge of the polygon 1021, between vertices 1054f and 1054g, is not dissected; and no evaluation point is placed on this edge.

Page 45, line 23 to page 46, line 2:

Figure 10C shows shifters 1012 shared across two true-gates 1003 that are not connected to each other. For each true-gate, a polygon 1022 provides a connector 1009 to other elements, not shown, trim regions 1026, and an end cap 1090. For example, polygon 1022a provides connector 1009d, trim regions 1026a and 1026b, and end cap 1090a, whereas polygon 1022b provides connector 1009f, trim regions 1026c and 1026d, and end cap 1090b.

Page 49, line 15 to page 50, line 2:

In another embodiment, the adjusted fabrication layout [136] is tested again with the proximity effects model to determine whether the agreement between the printed features layer (249 in Figure 2) and the design layout (225 in Figure 2) satisfy a pre-defined specification tolerance. If so, the corrections end. Otherwise, another round of corrections is

performed based on the current correction to further improve the agreement. This process iterates until the agreement converges on the specified tolerance for all edges, or it is determined that further improvement is not possible. In this embodiment, the recently adjusted fabrication layout produced during process 236 becomes the next proposed fabrication layout (231) and the processes 260 through 236 are repeated. For example, dissection points and evaluation points are selected for the new proposed layout, printed features are predicted with the model, and the differences are analyzed.